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FEEDING PRE-WEANED VEAL CALVES DURING WINTER MONTHS: Understanding Calf Metabolism and Milk Replacers

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THE EFFECT OF WEATHER ON VEAL CALF PERFORMANCE

When environmental temperatures start to drop, calves become susceptible to cold stress. However, cold stress is not only determined by temperature alone. It is also influenced by the age of the animal, ration, wind velocity, humidity, bedding material, drafts, etc.

How Does Cold Weather Affect a Calf?

Calves have a temperature sensitive comfort zone known as the **Thermoneutral Zone**. When the environmental temperature falls within this comfort zone, the calf will be able to maintain its own body temperature, since the amount of heat the calf produces will be equal to the amount of heat the calf loses (see *Figure 1*). The comfort zone for a calf falls somewhere between 15°C–25°C.

The **lower critical temperature** (LCT) is the temperature at which a calf must produce more heat to maintain its body temperature. For a fed calf the LCT is approximately 8°C–10°C (see *Figure 2*); for a newborn calf the LCT is between 13°C–20°C. The **absolute LCT** is the point at which heat production is at the maximum point that an animal can maintain over an extended period of time.

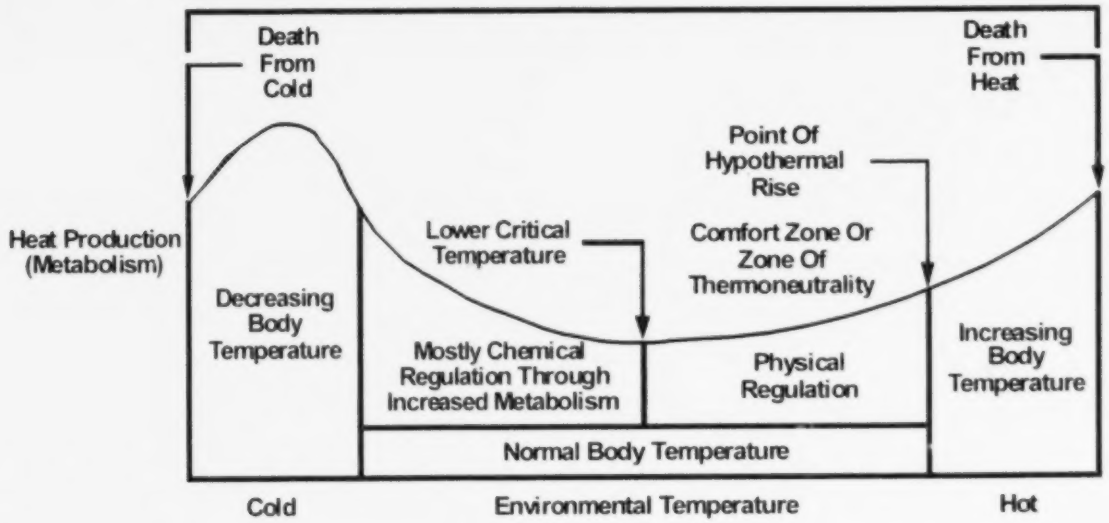

Figure 1. Physiological and metabolic changes in animals associated with changes in environmental temperature. (Adapted from Brody, 1945)

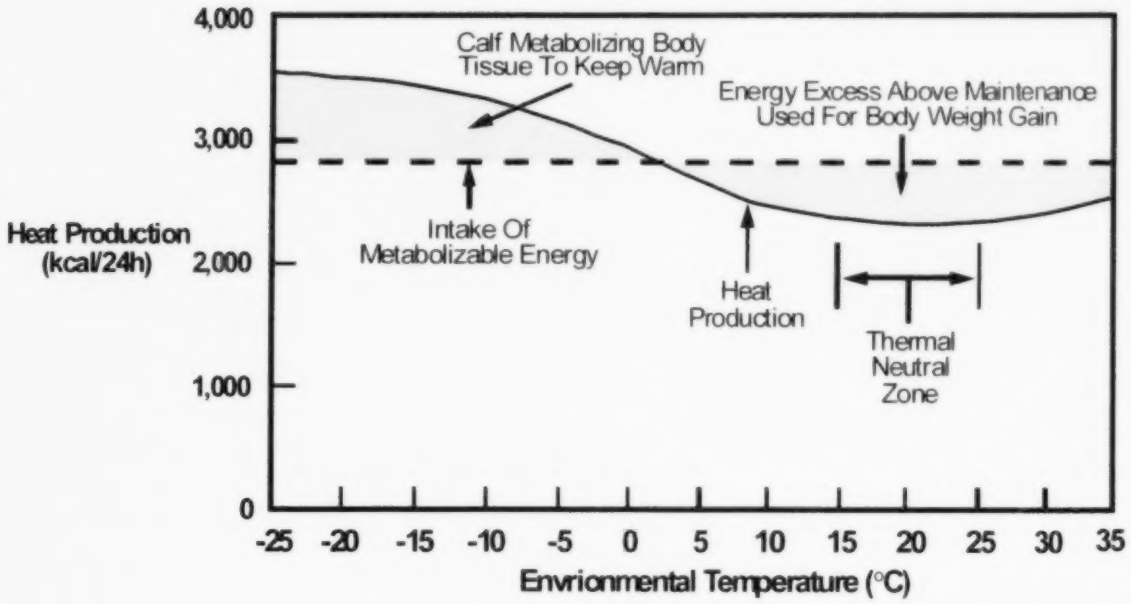

Figure 2. Effect of environmental temperature on heat production of a 45.5 kg calf and the amount of metabolizable energy available for gain in body weight after meeting the maintenance requirements. (Adapted from Gebremedhin et al., 1981)

Under moderate environmental temperatures, the calf is equipped to maintain its core body temperature (38.5°C) by using short term and long term regulatory mechanisms. As the temperature falls below the LCT, short term and long term responses are activated.

Short Term Response

- hair stands on end
- blood vessels leading to the extremities (ears and limbs) constrict
- shivering (can greatly increase heat production).

Long Term Response

- change in hair coat
- increase in subcutaneous fat
- increased metabolic rate.

Both the short term and long term responses require additional energy either from increased energy intake or from increased metabolism of body tissues. The goal is to feed the calf so that it maintains its own body heat and still has enough reserves left over for growth.

Death occurs if the calf remains unable to maintain its core body temperature for an extended time. As a calf gets older and its level of energy intake increases, the calf develops better heat production capabilities and will have more insulating properties (thicker skin and larger stores of subcutaneous fat).

Young calves have limited reserves of energy and these reserves are quickly depleted when temperatures dip below the LCT. For example, in a 40 kg (88 lb) newborn calf, energy reserves would be depleted in about 18 hours.

Calves housed in open barns with chilling drafts have actually shivered to death, losing as much as 10% of their body weight over night. When calves that have died in this manner are examined, they show signs of malnutrition because of their total lack of fat reserves. Starvation Syndrome is not feeding calves enough in winter months to account for the extra energy needs.

UNDERSTANDING MILK REPLACERS

During the pre-weaning stage of veal production, feeding a high quality milk replacer, along with a high quality calf starter, is essential to economic returns in veal production. Cheating on quality at this stage of growth not only decreases your feed efficiency, it could also lead to death in a cold weather-feeding environment.

Key Points to Remember

- Milk replacers provide all of the calf's nourishment for the first 3–4 weeks.
- The starter ration is fed primarily for rumen development.

- Energy is the engine that drives growth and development.
- Fat and protein interact to increase the absorption of both nutrients. If the fat content of a milk replacer is too high in relation to the protein, the excess fat becomes a lubricant. The milk replacer then passes through the calf, taking some protein with it, before they can be absorbed. This is called Nutritional Scours.
- Protein and fat should be separated by a 4–5 part spread.
- 20% protein, 15%–16% fat
- 22% protein, 18% fat
- Protein can be used as an energy source, but it is not economical.
- Protein is meant to drive calf growth.
- Fat must be present in adequate amounts to generate body heat, thereby freeing up protein for growth.

FEEDING CALVES DURING WINTER

In order to provide the calf with the excess energy it needs to maintain body temperature and growth during the winter, the diet becomes the first line of defense.

The most effective way of increasing energy in the diet is to increase the fat content of the milk replacer to 18%. A high quality milk replacer made from milk proteins and animal fat is ideal. By increasing only the fat percentage, you will give the calf the extra energy it requires in order to maintain its growth. Mix the higher fat milk replacer according to the manufacturer's directions.

TABLE 1. Recommended Protein and Fat Levels for Cold Weather Feeding

Temperature in the Calf Housing		Level of Protein in Milk Replacer (%)	Level of Fat in Milk Replacer (%)
>8°C	>46°F	20	15
<8°C	<46°F	22	18

Note: For higher fat rations the total amount of liquid fed stays the same.

A less preferred method of increasing the energy intake of a calf is to increase the total volume of milk replacer (15% fat) being fed. Calves in hutches or other cold environments require up to 15% of body weight as liquid nourishment when temperatures drop below freezing.

If you do not have access to a high fat milk replacer and wish to use this method of feeding, increase the amount of milk replacer by 2% for every degree the temperature falls below 5°C, or 1% for every degree below 42°F. For example, a total daily feeding of 4 L in warm weather increases to a requirement of 5 L at -5°C or 5.2 L at -10°C.

With this second method, you need to add a third meal per day to reduce the incidence of digestive upsets and scouring.

One other aspect to keep in mind during cold weather is the timing of weaning. Usually a calf can be weaned as soon as it consumes 1 kg (2 lb) of calf starter daily. However, during cold weather you do not want to wean a calf too soon. A few extra pounds of milk replacer are cheap when compared to the value of a lost calf.

RECOMMENDATIONS

- Keep shelters dry, protected from the wind and free from drafts.
- Use abundant bedding to raise the LCT.
- Avoid feeding diluted diets.
- Feed a high quality calf starter from a young age (free choice).
- Feed milk replacer with 18% fat.
- Warm calf's milk to body temperature, 38.5°C.
- Feed milk an additional week before weaning.

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